S
622.33
L3ccas
1988
Spectrum
Engineering (Firm)
Carbon County
AML statewide
maintenance Papez/
Aetna Project,
Carbon County,

STATE PUBLICATIONS COLLECTION
MAY 9 1990
MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

FINAL REPORT

CARBON COUNTY AML STATEWIDE MAINTENANCE PAPEZ/AETNA PROJECT CARBON COUNTY, MONTANA

DECEMBER 16, 1988

PLEASE RETURN

SPECTRUM ENGINEERING
MINING & CIVIL ENGINEERS

MONTANA STATE LIBRARY
S 622.33 L3ccas 1988 c.1
Carbon County AML statewide maintenance
3 0864 00067533 3

NRIS 46029

STATE DOCUMENTS COLLECTION

MAY 9 1990

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

FINAL REPORT

CARBON COUNTY AML STATEWIDE MAINTENANCE
PAPEZ/AETNA PROJECT
CARBON COUNTY, MONTANA

DECEMBER 16, 1988

Prepared for:

MR. RICHARD JUNTUNEN, CHIEF
Abandoned Mine Reclamation Bureau
Montana Department of State Lands
1625 Eleventh Avenue
Helena, Montana 59620

Prepared by:

SPECTRUM ENGINEERING
Mining & Civil Engineers
3302 Fourth Avenue North
Billings, Montana 59101

JAMES R. JOHNSON
Project Engineer

JAMES R. JOHNSON
Project Inspector

PLEASE RETURN

Digitized by the Internet Archive
in 2014

https://archive.org/details/carboncountyamls1988spec

PAPEZ/AETNA PROJECT
FINAL REPORT

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Project Objectives 1
1.2 Site Description and Location 1
1.3 Land Ownership and Access 4
1.4 History 4
1.4.1 Red Lodge Coal Field 4
1.4.2 Bear Creek Coal Field 5

2 DESCRIPTION OF RECLAMATION PROJECT 6
2.1 Site Hazards and Problems 6
2.2 Project Planning 11
2.3 Chronological History 11
2.4 Equipment 11
2.5 Daily Construction Log 11

3 SLIDES 13

4 COST SUMMARY 14

5 PROJECT SUMMARY 14
5.1 Completed Reclamation 14
5.2 Comments 14
5.3 Recommendations 14

APPENDIX A - SLIDE DESCRIPTIONS BY PROJECT 15

PAPEZ/AETNA PROJECT
FINAL REPORT

1 INTRODUCTION

1.1 Project Objectives

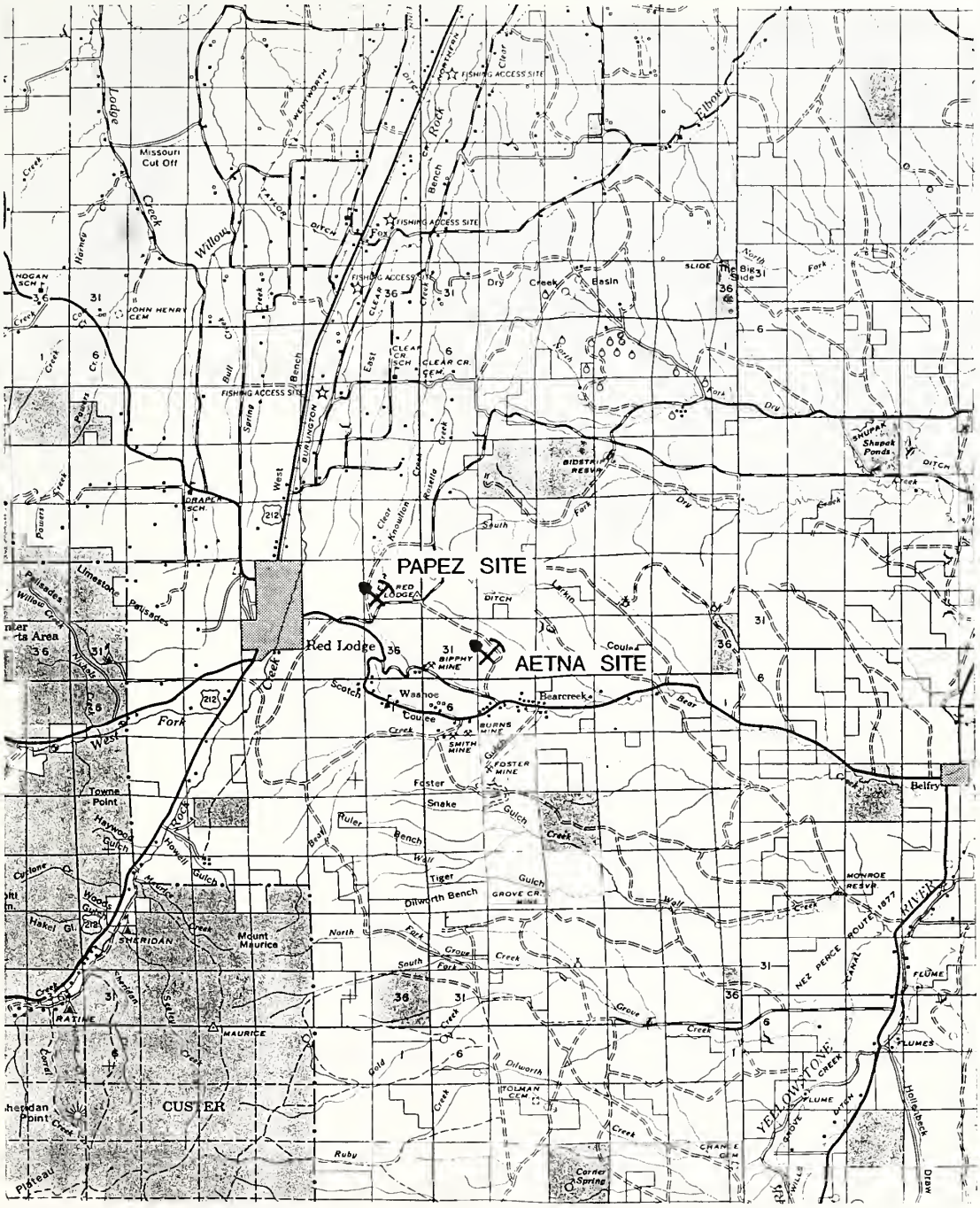
Reclamation work was performed under the statewide maintenance program to restore an area previously addressed under the AML program (Virtue Gulch Project - Carbon County, MT - 11/18/85). Per verbal authorization (8/5/88) from Ben Mundie of Montana Department of State Lands to Spectrum Engineering in Billings, Montana, several subsidence holes were to be backfilled. Initial on-site observations revealed that three subsidence holes (two having extensive openings) had recently occurred in a previously reclaimed area. In addition, two previously unidentified subsidence holes were found. Closing of the openings within the subsidence holes and backfilling was performed. Associated scattered debris was picked up and approximately an area of one acre where previous revegetation had failed was reseeded and mulched.

1.2 Site Description and Location

The Papez/Aetna project area is located 2 and 4 miles east of Red Lodge, Montana. The vicinity and site maps depict the location of each site.

The Papez site consists of several subsidence pits with one having an underground opening. The site area is scattered with debris consisting of old mine lumber. The landowner has limited work at this site to backfilling one subsidence hole having an opening and picking up the scattered debris. This site is located in the E2NW4SW4 of Section 25, Township 7 South, Range 20 East, Carbon County, Montana.

The Aetna site has been sub-divided into two sites called the Aetna No. 1 and Aetna No. 2. The Aetna No. 1 consists of one subsidence hole exhibiting an extreme threat to livestock, wildlife and humans. The Aetna No. 2 consists of three subsidence holes, two having underground openings and an area of approximately one acre where previous revegetation efforts failed. Both the Aetna No. 1 and No. 2 sites are respectively located within the S2SW4 and N2SW4 of Section 32, Township 7 South, Range 21 East, Carbon County, Montana.



STATE OF MONTANA — DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU—RECLAMATION DIVISION

VICINITY MAP

SITE PAPEZ/AETNA PROPERTY

CARBON COUNTY, MT; TOWNSHIP 7 S RANGE 20 & 21 E

SECTION(S) T 7 S, R 20 E, SEC. 25; T 7 S, R 21 E, SEC. 32

MAP SCALE: 1" = 2.5 Miles

JOHN PAPEZ

BEAR CREEK LAND & CATTLE CO.

AETNA LIFE

PAPEZ SITE

DEBRIS AREA

SUBSIDENCE PITS (NO ACTION)

SUBSIDENCE HOLE

CORRAL

AETNA #1 SUBSIDENCE HOLE

AETNA #2 SITE AREA

SUBSIDENCE HOLES

BORROW AND REVEGETATION AREA

Red Lodge (BM 5563)

Washoe

Bearcreek (BM 4578)

Rock Creek

Clear Creek

Scotch Coulee

Virtue Gulch

Dry Fork

Ditch

Gravel Pit

Mine Dump

Strip Mine

R 20 E

R 21 E

T 7 S

T 8 S

STATE OF MONTANA — DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU — RECLAMATION DIVISION

SITE MAP

SITE PAPEZ/AETNA PROPERTY

CARBON COUNTY, MT; TOWNSHIP 7 & 8 S RANGE 20 & 21 E

SECTION(S) T 7 S, R 20 E, SEC. 25; T 7 S, R 21 E, SEC. 32

MAP SCALE: 1" = 2000' U.S.G.S. QUAD SHEET RED LODGE EAST

1.3 Land Ownership and Access

Papez Site:	John Papez Drawer AD Bridger, MT 59014 Phone: 406/446-1571
Aetna No. 1 and Aetna No. 2 Sites:	Aetna Life Insurance c/o Butch Bratsky Farmer National Company P.O. Box 21016 Billings, Montana 59103 Phone: 406/656-2133

Access is obtained by traveling northeast out of Red Lodge on Route 382 for approximately 1.5 miles to an unmarked gravel road. Turn left onto the gravel road and proceeding easterly about 1 mile to the Papez site. Then proceed east about another .75 mile to an unmarked dirt road located near an old corral. Then turn right onto the dirt road and proceed south-easterly for approximately 1.5 miles to the Aetna sites.

1.4 History[1]

The Papez/Aetna sites are in the Red Lodge and Bear Creek coal fields.

1.4.1 Red Lodge Coal Field

During the mid 1860's James "Yankee Jim" George found the coal on the east side of Rock Creek. These exposed coal seems became known as the Red Lodge coal field. Since there was no accessible market at the time, many years elapsed before there was suitable transportation to utilize this coal.

In 1882 the Northern Pacific Railroad completed its mainline along the Yellowstone River and on to Bozeman. This opened up prospects of developing a market for the Red Lodge coal. At this time "Yankee Jim" and other investors hauled two wagon-loads of coal from Red Lodge to Billings for promotional purposes. With the persistence of these investors and Henry Villard (a major investor in the Northern Pacific system) the Rocky Fork Coal Company was formed to mine the coal from the Red Lodge field to provide coal for the railroad.

Prior to 1889, the miner's used hand-steel and blackpowder and developed exploratory adits east into the main coal seams. With the completion of the Laurel to Red Lodge railroad in 1889, commercial mining got underway.

---

[1]Anderson, Paul; Cultural Resource Inventory and Evaluation, Red Lodge East Bench-Washoe-Highway-Burns-Smith Mines; pg 8-10, May 6, 1983; Cultural Resource Division, GCM Services, Inc., Butte, MT.

Initial production in 1889 was 6,000 tons and expanded rapidly to over a million tons in 1920.

In 1922 the Northern Pacific prepared a study on alternative coal development. This study projected a lower coal cost by stripping coal from shallow deposits on Rosebud Creek some 30 miles south of Forsyth, Montana. In 1924, this area which later became known as Colstrip, began mining and produced 3 million tons over the next five year period. As production rose at Colstrip, it was cut back at Red Lodge, when in 1932 the mines produced only 54,000 tons and were eventually closed.

1.4.2 Bear Creek Coal Field

During the late 1890's, several companies were considering developing portions of the coal seams in the Bear Creek drainage. Development progressed slowly due to the lack of rail transportation.

In 1900 Montana Coal and Iron Company started exploration and development work at what became known as the Smith Mine. Coal was hauled by wagon to Red Lodge and shipped by rail from there. Then in 1903, the Northern Pacific built a branch rail line to Bridger, Montana. With the help of coal developers in the Bear Creek area, the rail line was extended to Bearcreek in 1906 and on to the Amalgamated Copper Company's Washoe Mine in 1907. The International Coal Company, the Bear Creek Coal Company and the Smokeless and Sootless Coal Company began coal operations in 1906 and 1907.

These companies operated mines in the Bear Creek coal field for several years with coal production peaking during World War I. The mines suffered from depressed market conditions in the 1920's and from increased competition of alternative power sources in the 1930's. However, coal production was substantially increased during World War II. In 1953, Northern Pacific shut down its Bridger rail line which resulted in the Montana Southern and Western Railroad to stop serving the area. This essentially caused the end of coal production from the Bear Creek coal field.

2 DESCRIPTION OF RECLAMATION PROJECT

2.1 Site Hazards and Problems

The Papez site (Photo 1) consists of several subsidence pits and scattered debris of mostly old mine lumber. Landowner consent restricted maintenance work to the backfilling of one subsidence hole having an underground opening and the removal of debris. The subsidence hole had a surface opening 4 feet wide by 5 feet long by 5 feet deep with a sloping hole 2 foot wide by 3 feet long by 8 feet deep. Estimated backfill volume is 5.5 cy and a revegetation area of 100 square feet.

The Aetna No. 1 site (Photo 2) consists of one subsidence hole having a surface opening of 22 feet in diameter by 15 feet deep and having a bottom diameter of 6 feet. Backfill volume is estimated at 85 cy and revegetation area of 625 square feet. During aerial reconnaissance on July 7, 1988 a live calf was found trapped in the hole. Spectrum Engineering notified the Carbon County Sheriff's Office and presummably the calf was rescued. On a subsequent site visit, Sept. 1, 1988, there was found to be a rather badly decayed dead calf laying at the bottom of the hole. This hole is of great danger to livestock, wildlife and humans.

The Aetna No. 2 site (Photo 3) consists of one shallow subsidence hole having a closed bottom, two subsidence holes with openings, and approximately one acre where previous revegetation efforts failed.

Aetna No. 2 - Subsidence Hole 1 (Photo 4) has a surface diameter of 7 feet and a depth of 18 inches. Backfill volume is estimated at 2 cy and a revegetation area of 100 square feet.

Aetna No. 2 - Subsidence Hole 2 (Photo 5) has general surface measurements of 15 feet wide by 18 feet long by 7 feet deep. In the bottom there is a 3 feet by 5 feet sloping opening of unknown depth. Backfill volume is estimated at 20 cy and a revegetation area of 400 square feet.

Aetna No. 2 - Subsidence Hole 3 (Photo 6) has a surface opening of 3 feet in diameter with an underlying cavity extending to 8 feet in diameter by 4 feet deep. A small 1 foot by 2 feet sloping opening having an unknown depth extends from the bottom of the cavity. Backfill volume is estimated at 4 cy and a revegetation area of 200 square feet.

The Aetna No. 2 area was previously seeded and hydromulched in 1985. In an area of about one acre (Photo 7) no vegetation had established. This area was ideally suited as a nearby source of borrow material to backfill all subsidence holes.

PHOTO 1 - Papez Site: Subsidence hole and debris.

PHOTO 2 - Aetna No. 1 Site: Subsidence hole with live calf.

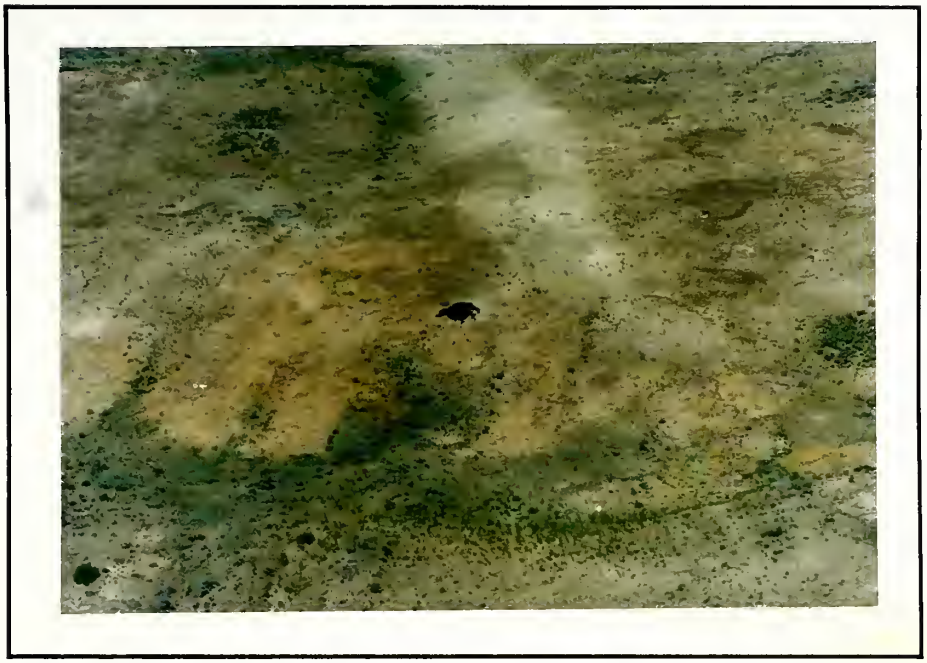


PHOTO 3 - Aetna No. 2 Site Area.

PHOTO 4 - Aetna No. 2 Site: Subsidence hole 1.

PHOTO 5 - Aetna No. 2 Site: Subsidence hole 2.

PHOTO 6 - Aetna No. 2 Site: Subsidence hole 3.

PHOTO 7 - Aetna No. 2 Site: Reclaimed site area.

2.2 Project Planning

The scope of work at the above sites was to backfill five subsidence holes, remove scattered debris and revegetate an area of one acre.

2.3 Chronological History

1. Initial site identification occurred on July 7, 1988 during aerial reconnaissance by Spectrum Engineering, Inc.

2. On August 5, 1988, a second aerial reconnaissance was performed by Jim Johnson of Spectrum Engineering and Ben Mundie from the Department of State Lands. Verbal authorization was given by Ben Mundie to proceed with mine maintenance work.

3. Land owner consent was obtained from Aetna Life (Farmers National) on August 17, 1988 and from John Papez on September 19, 1988.

4. A site visit was made on September 1, 1988. Field measurements were taken on the Aetna sites by Jim Johnson and Vern Heisler.

5. Big Sky Landscaping in Worden, Montana was contacted regarding the work to be performed. A pre-bid site visit was made on November 3. Present were Jim Johnson from Spectrum Engineering and John Kragt and Mike Kragt from Big Sky Landscaping. A bid of $2,380 was received from John Kragt on November 4 and was accepted by Jim Johnson. The engineer's estimate to perform work was approximately $2,600. Site construction was scheduled to begin on November 8, 1988.

6. Maintenance work began as scheduled on November 8, 1988 and proceeded through November 10, 1988.

2.4 Equipment

1. Bobcat 825;
2. Dump truck - 6 cy capacity;
3. Farm tractor with seed drill and disc-crimper;
4. Single - footed wacker (compactor); and
5. Flatbed trailer.

2.5 Daily Construction Log

November 8, 1988 - Dropped 3 bobcat loader buckets (approximately 1 cubic yard) of 6 inch to 12 inch rock into open subsidence hole on Papez property. Worked rock down into hole and hand shoveled dirt to fill void place between rocks. Backfilled hole with approximately

4 cy of fill. Fill material was a clay loam having sufficient moisture for excellent compaction. A single footed tamper (wacker) was used to compact fill to within 12 inches of the top. Following compaction, one (1) cubic yard of suitable topsoil material was placed on the backfill, spread, and mounded to a height of about 6 inches above the surrounding surface.

- Approximately 7 cubic yards of scattered debris (mostly old lumber) was picked-up from the Papez property and disposed of by the contractor.

- Approximately 25 cy of backfill material was hauled and dumped into the Aetna #1 subsidence hole.

- Approximately 1/3 acre of failed revegetation was drill seeded and hay mulched.

November 9, 1988

- Backfilled approximately 18 cy of material into Aetna No. 2 - Subsidence Hole 2. When backfill was to an accessible height, it was compacted in layers using a wacker until the hole was completely filled. Approximately 1 cy of topsoil was placed on fill, spread, and prepared for seeding.

- Backfilled 2 cy of material into Aetna No. 2 - Subsidence Hole 1. All material was considered as suitable topsoil. The fill was placed and spread using the bobcat loader.

- Using shovels, the overhang above the open cavity of Aetna No. 2 - Subsidence Hole 3, was cut back so backfill could easily be placed into cavity and compacted to the surface. Approximately 3 cy of backfill was placed into cavity. 1 cy of topsoil was spread by the bobcat loader.

- The topsoil on Aetna No. 2 - Subsidence Holes 2 and 3 were prepared for seeding using hand rakes. The areas were seeded and fertilized by the broadcast method, straw mulched, and erosion control blanket applied.

- Approximately 45 cy of additional backfill material was hauled and dumped into Aetna No. 1. Once the hole was accessible, the fill was compacted in layers using the wacker. After compacting to the surface, 3 cy of topsoil was placed, spread and mounded to a height of about 8 inches. The seedbed was prepared using

rakes and the area seeded and fertilized by the broadcast method and straw mulched.

- The seedbed was prepared using hand rakes on the Papez subsidence hole. The area was seeded and fertilized using the broadcast method.

- The borrow area at Aetna No. 2 was regraded to blend into surrounding terrain and salvaged topsoil replaced. The seedbed was prepared over an area about 2/3 acre by disking. The area was drill seeded and fertilized and straw mulch distributed by hand. The mulch was crimped using a disc-crimper.

November 10, 1988 - Erosion control blanket was applied to the Papez subsidence hole and Aetna No. 1.

3 SLIDES

The description of the slides taken to document the work performed at each of the sites is found in Appendix A. In addition, the original slides are found at the very back of one volume and black and white copies of the slides are found in all three volumes directly behind the slide descriptions in Appendix A.

4 COST SUMMARY

This statewide maintenance project was completed by Big Sky Landscaping of Worden, Montana for a fixed price of $2,380.

5 SUMMARY

5.1 Completed Reclamation

The Contractor completed the work in two consecutive days on-site. The application of erosion control blanket was applied by the site inspector from Spectrum Engineering.

5.2 Comments

All construction work was completed by the Contractor as specified and directed by the site inspector. Spectrum Engineering assisted in revegetating four subsidence holes and applying erosion control blanket.

The project proceeded as planned with no unusual situations happening on this job.

5.3 Recommendations

The sites should be visited during June 1989 to evaluate extent which backfill has settled and degree of vegetation growth.

APPENDIX A

SLIDE DESCRIPTIONS

BY PROJECT

PAPEZ/AETNA PROJECT
SLIDE DESCRIPTION

ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
20	11/8/88	1-12	Aetna No. 1 - Close-up of hole opening. Pic. No. 2.
21	11/8/88	1-13	Aetna No. 1 - Bottom of hole with dead calf.
22	11/8/88	2-11	Aetna No. 1 - Backfill dirt.
23	11/8/88	2-10	Aetna No. 1 - Initial backfill in bottom of hole.
24	11/9/88	3-2	Aetna No. 1 - More backfill dirt.
25	11/9/88	3-3	Aetna No. 1 - Compacting backfill.
26	11/9/88	3-9	Aetna No. 1 - Backfilling with bobcat. Pic. No. 1.
27	11/9/88	3-10	Aetna No. 1 - Backfilling with bobcat. Pic. No. 2.
28	11/9/88	3-11	Aetna No. 1 - Final compacted backfill mounded.
29	11/10/88	3-17	Aetna No. 1 - Erosion control blanket applied after seeding.
30	11/8/88	1-22	Aetna No. 2 - Subsidence Hole 1: small subsidence area, no opening. Pic. No. 1.
31	11/8/88	1-23	Aetna No. 2 - Subsidence Hole 1: close-up of small subsidence area.
32	11/8/88	1-17	Aetna No. 2 - Subsidence Hole 2: surface opening of subsidence hole.
33	11/8/88	1-18	Aetna No. 2 - Subsidence Hole 2: opening within subsidence hole.
34	11/8/88	2-8	Aetna No. 2 - Subsidence Hole 2:backfilling subsidence hole.
35	11/9/88	2-22	Aetna No. 2 - Subsidence Hole 2: backfill regraded.
36	11/9/88	2-23	Aetna No. 2 - Subsidence Hole 2: revegetation and erosion control blanket.

PAPEZ/AETNA PROJECT
SLIDE DESCRIPTION

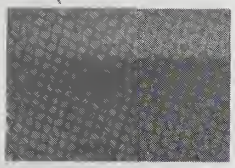
ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
37	11/8/88	1-19	Aetna No. 2 - Subsidence Hole 3: surface opening of subsidence cavity.
38	11/8/88	1-20	Aetna No. 2 - Subsidence Hole 3: inside subsidence cavity. Pic. No. 1.
39	11/8/88	1-21	Aetna No. 2 - Subsidence Hole 3: inside subsidence cavity. Pic. No. 2.
40	11/9/88	3-1	Aetna No. 2 - Subsidence Hole 3: excavating cavity roof in preparation for backfill.
41	11/9/88	2-16	Aetna No. 2 - Subsidence Hole 3:backfilling subsidence cavity.
42	11/9/88	2-17	Aetna No. 2 - Subsidence Hole 3: backfill spreading.
43	11/9/88	2-18	Aetna No. 2 - Subsidence Hole 3: compacting backfill.
44	11/9/88	2-20	Aetna No. 2 - Subsidence Hole 3: final backfill regrade.
45	11/9/88	2-21	Aetna No. 2 - Subsidence Hole 3: straw mulch following seeding.
46	11/9/88	2-24	Aetna No. 2 - Subsidence Hole 3: erosion control blanket in-place.
47	11/8/88	1-15	Aetna No. 2 - General site of borrow area. Pic. No. 1.
48	11/8/88	1-16	Aetna No. 2 - General site of borrow area. Pic. No. 2.
49	11/8/88	1-24	Aetna No. 2 - Straw mulch applied to borrow area.
50	11/8/88	2-1	Aetna No. 2 - Removal of topsoil from borrow area. Pic. No. 1.
51	11/8/88	2-2	Aetna No. 2 - Removal of topsoil from borrow area. Pic. No. 2.

PAPEZ/AETNA PROJECT
SLIDE DESCRIPTION

ASSIGNED NUMBER	DATE TAKEN	SLIDE NUMBER	SUBJECT OR COMMENTS
52	11/8/88	2-3	Aetna No. 2 - Wind-rowing of salvaged topsoil in borrow area.
53	11/8/88	2-4	Aetna No. 2 - Loading borrow material for backfill.
54	11/8/88	2-5	Aetna No. 2 - Digging borrow material.
55	11/8/88	2-9	Aetna No. 2 - Drill seeding failed revegetation area.
56	11/8/88	2-12	Aetna No. 2 - Loading borrow material for backfill.
57	11/9/88	2-13	Aetna No. 2 - Revegetated failed reclamation area.
58	11/9/88	2-14	Aetna No. 2 - Borrow area seedbed preparation. Pic. No. 1.
59	11/9/88	2-15	Aetna No. 2 - Borrow area seedbed preparation. Pic. No. 2.
60	11/9/88	2-19	Aetna No. 2 - Borrow area seedbed preparation. Pic. No. 3.
61	11/9/88	3-4	Aetna No. 2 - Regrading borrow area.
62	11/9/88	3-5	Aetna No. 2 - Spreading topsoil on borrow area.
63	11/9/88	3-6	Aetna No. 2 - Disking borrow area.
64	11/9/88	3-7	Aetna No. 2 - Disking borrow area.
65	11/9/88	3-8	Aetna No. 2 - Disking borrow area.
66	11/10/88	3-18	General site view of borrow area and Aetna No. 2 subsidence holes.

01 1-4

Papez Debris

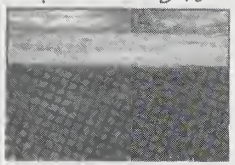


88/8/11

Site Area before Cleanup

02 11/9/88

Papez Debris 3-15

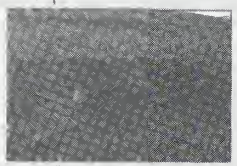


88/8/11

Site area after Cleanup

03 1-6

Papez Debris

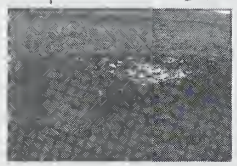


88/8/11

Before Clean-up

04

Papez Debris 3-14

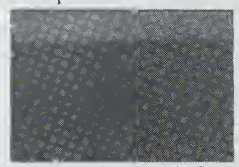


88/6/11

After clean-up

05 1-5

Papez Debris

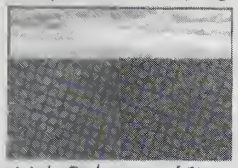


88/8/11

Adit Entrance Before

06

Papez Debris 3-13

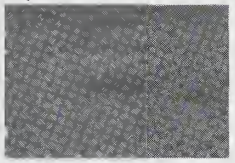


88/6/11

Adit Entrance After

07 1-1

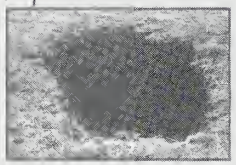
Papez Subsidence Hole



88/8/11

08 1-3

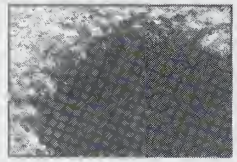
Papez Subsidence Hole



88/8/11

09 1-2

Papez Subsidence Hole



88/8/11

10 1-7

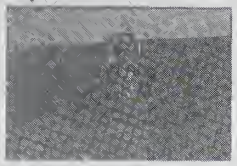
Papez Subsidence Hole

88/8/11

loading Borrow Rock

11 1-8

Papez Subsidence Hole

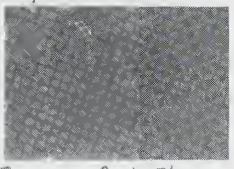


88/8/11

Dumping Borrow Rock

12 1-9

Papez Subsidence Hole

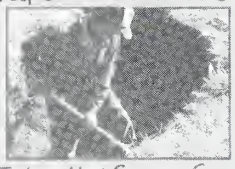


88/8/11

Borrow Rock Plug

13 1-10

Papez Subsidence Hole



88/8/11

Filling Void Space of Borrow Plug

14 2-6

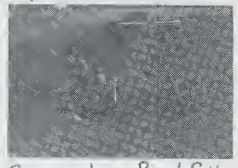
Papez Subsidence Hole

88/8/11

Backfill Dirt

15 2-7

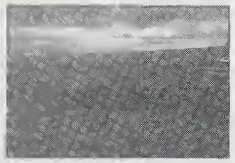
Papez Subsidence Hole



88/8/11

Compacting Backfill

16 Papez Subsidence Hole 3-12



88/01/11

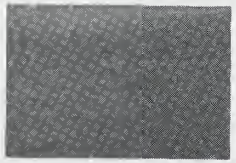
Final Regrade

17 Papez Subsidence Hole 3-16

88/01/11

Erosion Control Blanket

18 1-11 Aetna 1



88/8/11

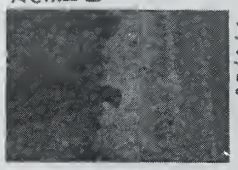
Gen. Site Area

19 1-14 Aetna 1

88/8/11

Hole Opening

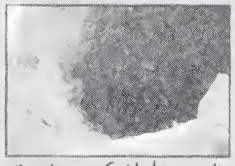
1-12 Aetna 1 20



88/8/11 top

Hole Opening

21 1-13 Aetna 1



88/8/11

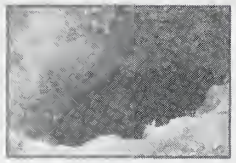
Bottom of Hole with Dead Calf

22 2-11 Aetna 1

88/8/11

Backfill Dirt

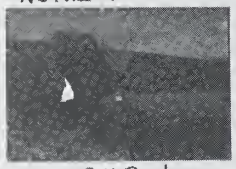
23 2-10 Aetna 1



88/8/11

Backfill in Hole

24 3-2 Aetna 1



88/9/11

Backfill Dirt

25 3-3 Aetna 1

88/9/11

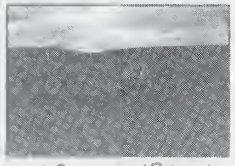
Compacting Backfill

26 Aetna 1 3-9

88/9/11

Backfilling w/ Bobcat

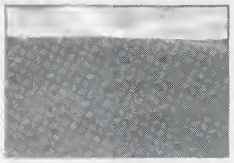
27 Aetna 1 3-10



88/9/11

Backfilling w/ Bobcat

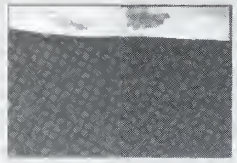
28 Aetna 1 3-11



88/9/11

Final Regrade

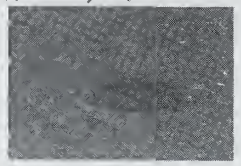
29 Aetna 1 3-17



88/9/11

Erosion Control Blanket

30 1-22 Aetna 2, Hole 1

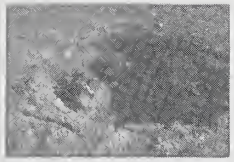


88/8/11

Subsidence Area

31 1-23

Aetna 2, Hole 1



11/8/88

Subsidence Area

32 1-17

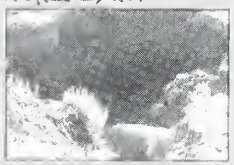
Aetna 2, Hole 2

11/8/88

Subsidence Hole

33 1-18

Aetna 2, Hole 2



11/8/88

Subsidence Opening

34 2-8

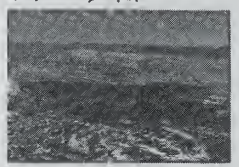
Aetna 2, Hole 2

11/8/88

Backfilling Hole

35 2-22

Aetna 2, Hole 2

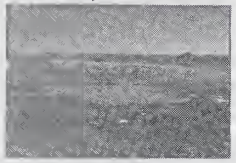


11/6/88

Backfill Regraded

36 2-23

Aetna 2, Hole 2

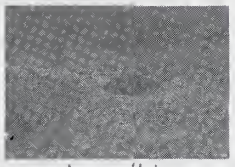


11/6/88

Erosion Control Blanket

37 1-19

Aetna 2, Hole 3

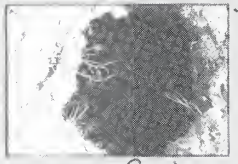


11/8/88

Subsidence Hole

38 1-20

Aetna 2, Hole 3

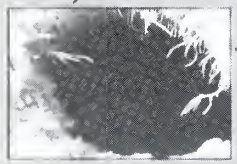


11/8/88 TOS

Subsidence Cavity

39 1-21

Aetna 2, Hole 3

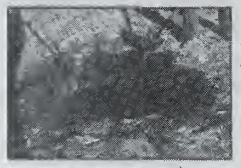


11/8/88

Subsidence Cavity

40 3-1

Aetna 2, Hole 3

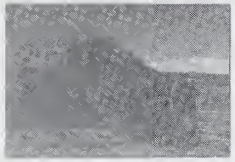


11/6/88

Excavating Cavity Roof

41 2-16

Aetna 2, Hole 3



11/9/88

Backfilling Cavity

42 2-17

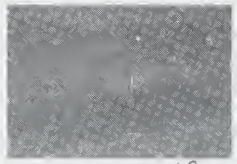
Aetna 2, Hole 3

11/9/88

Spreading Backfill

43 2-18

Aetna 2, Hole 3

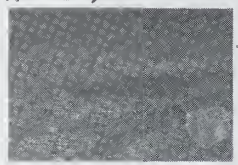


11/9/88

Compacting Backfill

44 2-20

Aetna 2, Hole 3

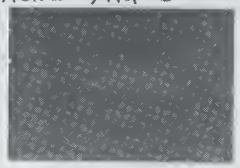


11/9/88

Final Regrade

45 2-21

Aetna 2, Hole 3



11/6/88

Straw Mulch

46 2-24

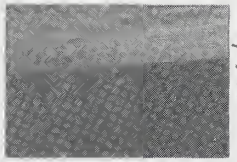
Aetna 2, Hole 3

8/8/11

Erosion Control Blanket

47 1-15

Aetna 2

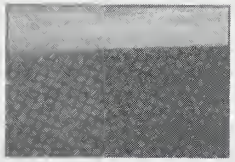


8/8/11

Borrow Area

48 1-16

Aetna 2



8/8/11

Borrow Area

49 1-24

Aetna 2

8/8/11

Straw Mulch for Borrow Area

50 2-1

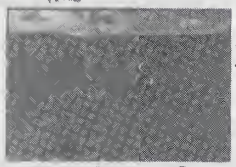
Aetna 2

8/8/11

Topsoil Salvage from Borrow Area

51 2-2

Aetna 2

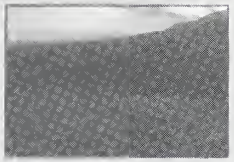


8/8/11

Topsoil Salvage from Borrow Area

52 2-3

Aetna 2

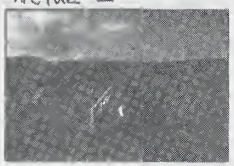


8/8/11

Salvaging Topsoil

53 2-4

Aetna 2

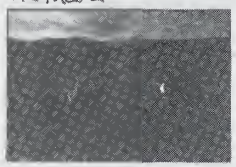


8/8/11

Loading Borrow

54 2-5

Aetna 2



8/8/11

Digging Borrow

55 2-9

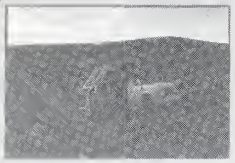
Aetna 2

8/8/11

Drill Seeding

56 2-12

Aetna 2



8/8/11

Loading Borrow

57 2-13

Aetna 2

8/8/11

Revegetated Area

58 2-14

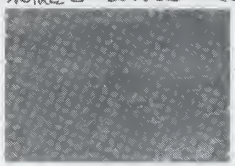
Aetna 2 - Borrow Area

8/8/11

Seedbed Preparation

59 2-15

Aetna 2 - Borrow Area



8/8/11

Seedbed Preparation

60 2-19

Aetna 2- Borrow Area

8/8/11

Seedbed Preparation

61 3-4

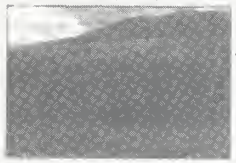
Aetna 2

88/4/11

Regrading Borrow Area

62

Aetna 2 - Borrow Area 3-5

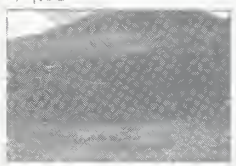


88/6/11

Topsoil Replacement

63

Aetna 2 3-6

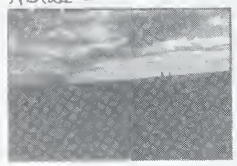


88/9/11

Disking Borrow Area

64

Aetna 2 3-7

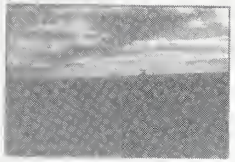


88/5/11

Disking Borrow Area

65

Aetna 2 3-8



88/4/11

Disking Borrow Area

66

Aetna 2 3-18

Site Area after Maintenance